



UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/784,275	02/24/2004	Tsutomu Tetsuka	648.43518X00	8920

20457 7590 10/13/2006

ANTONELLI, TERRY, STOUT & KRAUS, LLP
1300 NORTH SEVENTEENTH STREET
SUITE 1800
ARLINGTON, VA 22209-3873

EXAMINER

ZERVIGON, RUDY

ART UNIT	PAPER NUMBER
----------	--------------

1763

DATE MAILED: 10/13/2006

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

10/784,275

Applicant(s)

TETSUKA ET AL.

Examiner

Rudy Zervigon

Art Unit

1763

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 20 July 2006.
- 2a) ☒ This action is **FINAL**. 2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-5 and 7-12 is/are pending in the application.
- 4a) Of the above claim(s) 9 is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1-5, 7, 8 and 10-12 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☒ All b) ☐ Some * c) ☐ None of:
1. ☒ Certified copies of the priority documents have been received.
 2. ☐ Certified copies of the priority documents have been received in Application No. _____.
 3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- | | |
|--|---|
| 1) <input type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413)
Paper No(s)/Mail Date. _____ |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | 5) <input type="checkbox"/> Notice of Informal Patent Application |
| 3) <input checked="" type="checkbox"/> Information Disclosure Statement(s) (PTO/SB/08)
Paper No(s)/Mail Date <u>2/24/2004</u> . | 6) <input type="checkbox"/> Other: _____ |

DETAILED ACTION

Election/Restrictions

1. This application contains claim 9 drawn to an invention nonelected with traverse in Paper No. April 20, 2006. A complete reply to the final rejection must include cancellation of nonelected claims or other appropriate action (37 CFR 1.144) See MPEP § 821.01.

Claim Rejections - 35 USC § 112

2. The following is a quotation of the first paragraph of 35 U.S.C. 112:

The specification shall contain a written description of the invention, and of the manner and process of making and using it, in such full, clear, concise, and exact terms as to enable any person skilled in the art to which it pertains, or with which it is most nearly connected, to make and use the same and shall set forth the best mode contemplated by the inventor of carrying out his invention.

3. The following is a quotation of the second paragraph of 35 U.S.C. 112:

The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

4. Claims 1-5, 7, 8, and 10-12 are rejected under 35 U.S.C. 112, first paragraph, as failing to comply with the enablement requirement. The claims contains subject matter which was not described in the specification in such a way as to enable one skilled in the art to which it pertains, or with which it is most nearly connected, to make and/or use the invention. Applicant's attempt to clarify prior rejections under 112 resulted inan amendment to the specification where "conductive portion or member 21a" does not clarify in the application where/what is said "portion" relative to the other claimed components. 21a in Figure 1 is not enumerated in the more detailed Figures 5a-c, resubmitted and unchanged, and thus does not enable one skilled in the art to which it pertains, or with which it is most nearly connected, to make and/or use the invention. How can "a surface portion of an inner wall of the reaction chamber that is directly exposed to plasma" be also covered with a dielectric?

Art Unit: 1763

5. Claims 1-5, 7, 8, and 10-12 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention. The claims require “a DC earth”, “the DC earth”. It is uncertain what if any additional element is being claimed. Is “a DC earth” the unprotected chamber – Applicant’s 101; Figure 5a?

Claim Rejections - 35 USC § 103

6. The text of those sections of Title 35, U.S. Code not included in this action can be found in a prior Office action.

7. Claims 1, 7, and 8 are rejected under 35 U.S.C. 103(a) as being unpatentable over Kadomura; Shingo et al. (US 6391437 B1) in view of Kazumi; Hideyuki et al. (US 6388624 B1). Kadomura teaches a plasma (“dry etching”; column 45, line 57) processing apparatus (Figure 16; column 45, line 56 - column 46, line 60) for processing a substrate (40; Figure 16; column 44 line 4) with plasma (“dry etching”; column 45, line 57) by applying a high frequency (91; Figure 16; column 46, line 1) to a reaction chamber (21a; Figure 16,22b) so as to generate plasma (“dry etching”; column 45, line 57) therein, and applying a second high frequency (32; Figure 16) to a substrate holder (10; Figure 16) on which the substrate (40; Figure 16; column 44 line 4) is placed so as to control the ion energy to the substrate (40; Figure 16; column 44 line 4); wherein a surface portion of an inner side wall (18a; Figure 22b) of the reaction chamber (21a; Figure 16,22b) that is exposed to the plasma (“dry etching”; column 45, line 57) is substantially covered with a dielectric (112; Figure 22b), an electrically conductive portion (18a; Figure 22b) is disposed so as to be exposed to the plasma at a portion of the surface portion of the inner side wall (18a; Figure 22b) of the reaction chamber (21a; Figure 16,22b) which is at least partially

Art Unit: 1763

covered with the dielectric (112; Figure 22b) and is electrically coupled to the inner side wall (18a; Figure 22b) of the reaction chamber (21a; Figure 16,22b) or earth so as to form, DC earth (see chamber grounding - 21a; Figure 16) - claim 1. Applicant's claim requirement of "so as to control the ion energy to the substrate" is a claim requirement of intended use. When the structure recited in the reference is substantially identical to that of the claims, claimed properties or functions are presumed to be inherent (In re Best, 562 F.2d 1252, 1255, 195 USPQ 430, 433 (CCPA 1977); MPEP 2112.01).

Kadomura further teaches:

- i. The plasma ("dry etching"; column 45, line 57) processing apparatus (Figure 16; column 45, line 56 - column 46, line 60) according to any one of claims 1 through 3, wherein either a base material (112; Figure 22b) of the DC earth (see chamber grounding - 21a; Figure 16) or a protective coating (112; Figure 22b) disposed on a surface of the DC earth (see chamber grounding - 21a; Figure 16) coming into contact with the plasma ("dry etching"; column 45, line 57) is composed of conductive ceramic, SiC, Al or Al compound, as claimed by claim 7
- ii. The plasma ("dry etching"; column 45, line 57) processing apparatus (Figure 16; column 45, line 56 - column 46, line 60) according to any one of claims 1 through 3, wherein when a base material (112; Figure 22b) of the DC earth (see chamber grounding - 21a; Figure 16) is composed of a non-metallic material such as conductive ceramic, SiC, Al or Al compound, a conductive member (18a; Figure 20a) having a conductivity σ of $1 \Omega\text{-cm}$ or less is provided to a surface of the DC earth (see chamber grounding - 21a; Figure 16) by evaporation, spraying or interposing, thereby reducing an earth (see chamber

Art Unit: 1763

grounding - 21a; Figure 16) resistance of the DC earth (see chamber grounding - 21a; Figure 16), as claimed by claim 8

Kadomura does not teach:

- i. the electrically conductive portion (18a; Figure 22b) has an area corresponding to less than 10% of the inner side wall (18a; Figure 22b) area of the reaction chamber (21a; Figure 16,22b), a magnetic field generation means is disposed outside of the reaction chamber (21a; Figure 16,22b) so as to apply a magnetic field to the plasma, and the DC earth (see chamber grounding - 21a; Figure 16) is disposed at a position crossing a magnetic line of force that is closer to the substrate holder (10; Figure 16) than a magnetic line of force that crosses either the inner side wall (18a; Figure 22b) of the reaction chamber (21a; Figure 16,22b) having the dielectric (112; Figure 22b) thereon or a surface of an earth (see chamber grounding - 21a; Figure 16) member disposed on the inner side wall (18a; Figure 22b) of the reaction chamber (21a; Figure 16,22b) – claim 1

Kazumi teaches a similar capacitive coupling plasma apparatus (Figure 3) including equivalent means (16; Figure 1) for magnetic field generation.

It would have been obvious to one of ordinary skill in the art at the time the invention was made to add Kazumi's equivalent means (16; Figure 1) for magnetic field generation to the apparatus of Kadomura, and to optimize the exposed/unexposed surface area as claimed.

Motivation to add Kazumi's equivalent means for magnetic field generation to the apparatus of Kadomura, and to optimize the exposed/unexposed surface area as claimed. is for creating a plasma with "high density and high uniformity can be generated in a wide parameter region" as taught by Kazumi (abstract) is for minimizing cost associated with added materials.

Art Unit: 1763

8. Claims 2, 3, and 5 are rejected under 35 U.S.C. 103(a) as being unpatentable over Kadomura; Shingo et al. (US 6391437 B1). Kadomura is discussed above. Kadomura further teaches:

- i. The plasma (“dry etching”; column 45, line 57) processing apparatus (Figure 16; column 45, line 56 - column 46, line 60) according to claim 1, wherein the dielectric (112; Figure 22b) covers 90% or more (see 21a; Figure 16) of a total surface area that is directly exposed to plasma (“dry etching”; column 45, line 57) – claim 2

Kadomura does not teach:

- i. the conductive portion (18a; Figure 22b) has an area of the inner side wall of the reaction chamber that is exposed to the plasma – claim 2
- ii. The plasma (“dry etching”; column 45, line 57) processing apparatus (Figure 16; column 45, line 56 - column 46, line 60) according to claim 1, wherein the electrically conductive portion (18a; Figure 22b) has an area corresponding to 0.1% to 10% of the area of the inner side wall (18a; Figure 22b) of the reaction chamber (21a; Figure 16,22b), as claimed by claim 3
- iii. The plasma (“dry etching”; column 45, line 57) processing apparatus (Figure 16; column 45, line 56 - column 46, line 60) according to any one of claims 1 through 3, wherein the dielectric (112; Figure 22b) is a protective coating (112; Figure 22b) formed of insulating ceramic such as carbide, oxide or nitride, as exemplified by SiC, boron carbide and alumite, and a thickness d of the dielectric (112; Figure 22b) coating is determined so that, with respect to the relationship between frequency f of the high frequency (91; Figure 16; column 46, line 1) applied to the substrate (40; Figure 16; column 44 line 4)

Art Unit: 1763

and the dielectric (112; Figure 22b) constant ϵ of the dielectric (112; Figure 22b),
an impedance per unit area $R=d/(2\pi f\epsilon)$ when high frequency (91; Figure 16;
column 46, line 1) is propagated by capacitive coupling through the dielectric (112; Figure
22b) portion is $100 \cdot \Omega$ or smaller, as claimed by claim 5

It would have been obvious to one of ordinary skill in the art at the time the invention was made
for Kadomura to optimize the thickness of Kadomura's chamber surface parts (111B; Figure
20A).

Motivation for Kadomura to optimize the thickness of Kadomura's chamber surface parts is for
minimizing the stress due to thermal expansion as taught by Kadomura (column 29; lines 1-10).

9. Claims 4, and 10-12 are rejected under 35 U.S.C. 103(a) as being unpatentable over
Kadomura; Shingo et al. (US 6391437 B1). Kadomura is discussed above. Kadomura further
teaches the plasma processing apparatus according claim 4, wherein either a base material of the
DC earth (see chamber grounding - 21a; Figure 16) or a protective coating (112; Figure 22b)
disposed on a surface of the DC earth (see chamber grounding - 21a; Figure 16) coming into
contact with the plasma is composed of conductive ceramic, SiC, Al or Al compound.

Kadomura further teaches the plasma ("dry etching"; column 45, line 57) processing apparatus
(Figure 16; column 45, line 56 - column 46, line 60) according to any one of claims 1 through 3,
wherein the DC earth (see chamber grounding - 21a; Figure 16) is located at a position where a
floating potential of plasma ("dry etching"; column 45, line 57) is substantially equal to or
greater than a floating potential of the plasma ("dry etching"; column 45, line 57) at either the
inner side wall (18a; Figure 22b) of the reaction chamber (21a; Figure 16, 22b) covered with the
dielectric (112; Figure 22b) or the surface of the earth (see chamber grounding - 21a; Figure 16)

Art Unit: 1763

member disposed on the inner side wall (18a; Figure 22b) of the reaction chamber (21a; Figure 16,22b), with respect to the high frequency (91; Figure 16; column 46, line 1) or the second high frequency (32; Figure 16), as claimed by claim 4.

It is uncertain if Kadomura's location of the DC earth is located at a position with Applicant's desired outcome. However, the Examiner believes that relocating an apparatus component may be an intended use of the pending apparatus claims. Further, it has been held that claim language that simply specifies an intended use or field of use for the invention generally will not limit the scope of a claim (Walter , 618 F.2d at 769, 205 USPQ at 409; MPEP 2106). Additionally, in apparatus claims, intended use must result in a structural difference between the claimed invention and the prior art in order to patentably distinguish the claimed invention from the prior art. If the prior art structure is capable of performing the intended use, then it meets the claim (In re Casey, 152 USPQ 235 (CCPA 1967); In re Otto , 136 USPQ 458, 459 (CCPA 1963); MPEP2111.02).

Kadomura does not teach

- i. that the plasma processing apparatus according to claim 4, wherein the dielectric (112; Figure 22b) is a protective coating (112; Figure 22b) formed of insulating ceramic such as carbide, oxide or nitride, as exemplified by SiC, boron carbide and alumite, and a thickness d of the dielectric (112; Figure 22b) coating (112; Figure 22b) is determined so that, with respect to the relationship between frequency f of the high frequency applied to the substrate and the dielectric (112; Figure 22b) constant E of the dielectric (112; Figure 22b), an impedance per unit area $R = d/(2\pi fE)$ when high frequency is propagated by

Art Unit: 1763

capacitive coupling through the dielectric (112; Figure 22b) is 100 ohm or smaller, as claimed by claim 10

- ii. The plasma processing apparatus according to claim 4, wherein when a base material (114c - "PBN"; Figure 22b) of the DC earth (see chamber grounding - 21a; Figure 16) is composed of a non-metallic material such as conductive ceramic, SiC, Al or Al compound, a conductive member having a conductivity c of 1 ohm-cm or less is provided to a surface of the DC earth (see chamber grounding - 21a; Figure 16) by evaporation, spraying or interposing, thereby reducing an earth (see chamber grounding - 21a; Figure 16) resistance of the DC earth (see chamber grounding - 21a; Figure 16), as claimed by claim 12

In the event that Kadomura's apparatus is not deemed to anticipate the DC earth is being located at a position with Applicant's desired outcome:

It would have been obvious to one of ordinary skill in the art at the time the invention was made to optimize the relative position(s) and/or dimensions of Kadomura's apparatus parts.

Motivation to optimize the relative position(s) and/or dimensions of Kadomura's apparatus parts is to optimize the operation of the apparatus. Further, it is well established that the rearrangement of parts is considered obvious to those of ordinary skill (*In re Japikse* , 181 F.2d 1019, 86 USPQ 70 (CCPA 1950); *In re Kuhle* , 526 F.2d 553, 188 USPQ 7 (CCPA 1975); *Ex parte Chicago Rawhide Manufacturing Co.* , 223 USPQ 351, 353 (Bd. Pat. App. & Inter. 1984).; MPEP 2144.04)

Response to Arguments

10. Applicant's arguments with respect to claims 1-5, 7, 8, and 10-12 have been considered but are moot in view of the new grounds of rejection.

Conclusion

11. Applicant's amendment necessitated the new grounds of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

12. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Examiner Rudy Zervigon whose telephone number is (571) 272-1442. The examiner can normally be reached on a Monday through Thursday schedule from 8am through 7pm. The official fax phone number for the 1763 art unit is (571) 273-8300. Any Inquiry of a general nature or relating to the status of this application or proceeding should be directed to the Chemical and Materials Engineering art unit receptionist at (571) 272-1700. If the examiner

Art Unit: 1763

can not be reached please contact the examiner's supervisor, Parviz Hassanzadeh, at (571) 272-1435.

Prof Zuri
10/24/16